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Process and Device for Handling and Packaging Fibrous Materials in the Form of Mats

Applicant: OWENS-CORNING FIBERGLAS CORPORATION, United States of America.

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(Patent application filed in the United States of America May 18, 1965, under no. 456,748, in the names of William B. Hullhorst, Pierce B. Brown, *and* William H. Mosier.)

The present invention relates to a process and a device used to handle packaging materials in general and, in particular, a process and means used to handle and package a fibrous material in a manner that facilitates its handling and transport.

The conventional practice for packaging or preparation of a fibrous material, like materials formed from glass fibers used especially for heat insulation, consists of stacking predetermined lengths of fibrous mats by arranging them in a continuous manner, compressing the stack or group of mats in a direction perpendicular to them, and putting the compressed assembly into paper bags or pre-shaped containers that are sealed or stapled to enclose the assembly. This packaging or preparation process for fibrous mats for their handling and shipment was very costly, because, among other things, the bags, which are necessarily made from a thick material, are costly and manual handling requires substantial work. The bags or packages for the fibrous material must have relatively high tear resistance, so as to adequately support rough handling and to resist the expansion force of the mats, owing to their tendency to return to their

normal thickness. Moreover, by applying compression to the outside of the assembled mats, non-uniform compression of the mats is obtained and, in many cases, one or more sections of the stacked mats can be sufficiently compressed to rupture or break individual fibers, which reduces the elasticity of the mat. When such mats are unpackaged to be employed or used, the fibers, if they are crushed or broken, do not spring back, and do not return to their normal swollen state. Rupture of fibers substantially reduces their insulation value, which makes the mats incapable of the intended applications.

Another process that has been used to package mats of free mineral fibers consists of wrapping the mats with a sheet of paper, the wrapped paper then being subjected to a compression force applied to the exterior, and the compressed roll being put into a paper envelope or bag. When the paper sheet is wrapped around the fibrous mats, the fibers in the resulting roll are in the free or napped state. When an external compression force is applied to the slightly clamped roll, the turns of the mat are compressed irregularly, and the paper is folded or tears and tends to assume a "funnel" shape toward the center, which produces troublesome swelling in the fibrous material. Moreover, it has found that it is not satisfactory to compress the finished roll mechanically and to reduce the volume to a substantial degree, due to the fact that the fibers are compressed in an exaggerated manner in certain zones of the roll and are broken, which is a drawback, as mentioned above.

Consequently, the purpose of the present invention is to provide an improved means and process:

That permits handling and packaging of material;

That serves to package fibrous materials and permits packaging of a larger amount of this fibrous material in the same volume occupied by previous similar packages, without rupturing or mechanically destroying the fibers and, consequently, without reducing the insulation value and elasticity of this material, so that the fibers spring back to resume their normal swollen state when the package is opened;

That serves to prevent stacks of fibrous mats from undergoing buckling during a compression process;

To place the fibrous material in a position where it is compressed, to relieve the fibrous material compressed in the packaging device and then unload the swollen packaging device from a device handling it.

The present invention therefore pertains to a process for packaging of a mass of fibrous material, which consists of evacuating air from the interior of the mass and enclosing the mass so freed of its air in a package. The mass of fibrous materials can advantageously be compressed mechanically, during which air is evacuated. When the stack of fibrous mats is compressed, a negative pressure can be used advantageously, applied on one side of the mat to prevent the column formed by the stack from buckling during compression, the negative pressure also serving, if desired, to aspirate air from the interior of the fibrous mats as they are compressed.

The present invention also provides a process for handling of a package that is swollen against its holding surfaces, forming an air film between the package and at least one of the holding surfaces to facilitate removal of the package. Another handling process of the material consists of using a surface that exerts a negative pressure in the vicinity of the material being handled and then bringing the surface to a desired position.

The present invention also provides a device that serves to employ the mentioned processes, which contains a means used to compress a mass of fibrous material and a means used to aspirate air from the interior of the mass of materials. Means are used to mechanically compress the mass of fibrous materials, while air is aspirated, and means are used to package the compressed mass. Devices forming transverse pistons are used to introduce the compressed mass to the package. Devices are used to form a support surface equipped with an air film for the compressed mass as it is introduced into the package.

The transverse pistons can advantageously include devices used to form a negative pressure surface in the vicinity of the compressed mass to keep it compressed. The packaging device can include opposite and spaced jaws that are used to keep a package open to receive the compressed mass from the transverse piston. Devices are used to remove the package and compressed material from the jaws, these devices containing opposite compression surfaces that are used to reduce the pressure exerted by the package against the jaws. An air film can be arranged between the package and at least one of the compression surfaces to facilitate removal of the package. At least one of the compression surfaces can advantageously consist of a conveyor. At least one of the compression surfaces can also be curved outward away from the package at its removal end, so that the package can swell slowly as it is removed to avoid shear or rupture of the package.

The present invention also provides a process and device to make wrapped packages of fibrous materials, this device comprising a mandrel, a device used to wrap a section of fibrous material onto the mandrel and a device used to evacuate air from the interior of the fibrous material as it is wrapped onto the mandrel.

Other advantages and characteristics of the present invention will be apparent in the following detailed description with respect to the appended drawings, which show several variants according to the invention in explanatory, but not limiting manner.

In the drawings:

Figure 1 is a perspective view of a device according to the present invention.

Figure 2 is a perspective view of the variant depicted in Figure 1, showing an additional phase of the process;

Figure 3 is a perspective view of a second variant according to the present invention;

Figure 4 is a view of the device shown in Figure 3, indicating its functioning;

Figure 5 is a perspective view of the third variant according to the present invention;

Figure 6 is a perspective view of the device of Figure 5, with partial removal of certain parts to clearly show the relations existing between certain components and their function;

Figure 7 is an end view of the device of Figure 6, schematically showing the relative positions of the different components;

Figure 8 is an end view of the device shown in Figure 7, representing the positions of the additional components of the device;

Figure 9 is a front view of the device shown in Figure 5, representing the arrangement of the different components;

Figure 10 is a perspective view of a device forming a transverse piston of the device in Figure 5 and showing its design more clearly;

Figure 11 is a front view of a mandrel that represents a fourth variant according to the present invention;

Figure 12 is an end view of one of the circular end plates of the device depicted in Figure 11.

The present invention is described by referring to its use to compress and package certain amounts of fibrous materials in bulk or a series of mats or sections of mineral materials, like glass fibers, slag fibers, fusible rock fibers, etc. For a number of years, mats of fibers formed

from mineral materials have been produced, and these mats have been widely used for heat and sound insulation of buildings and as heat insulation in appliances, like refrigerators, freezers, furnaces, water heaters, as well as in locations, where heat losses or any heat transmission must be avoided as much as possible.

The fibrous mats of this type are ordinarily formed by thinning a fiber-forming material with high-velocity gas jets, so that the fibers accumulate and are assembled randomly, forming a mass or mat of substantial thickness. The fact that the mats must necessarily be thick to permit forced insulation and effective sound damping increases the price of their transportation, due to the volume occupied by the fibrous masses or mats. Although the mats are relatively light, they normally occupy a relatively large volume per unit weight.

As previously mentioned, an attempt has been made to use different packaging processes with variable success. The main difficulty encountered in most previous packaging methods was the fact that, by compressing the mats to an extent that permits economical transport, ruptures of the fibers sometimes occurred, due to the employed processes and mechanical compression equipment, which reduce their value as an insulator and the capacity of the fibers to spring back.

It was found that air can be evacuated from the interior of the mass of fibrous material of the mats and greater compression can be achieved without rupturing the fibers forming the mats. Referring to Figure 1, a first variant according to the present invention is shown, in which a series of mats 20 can be brought by a conveyor 21 to a packaging device, shown generally at 30. The packaging device 30 comprises a container in the form of a box 31, to which one or more chambers or headers 32 are attached on one or more sides of container 31. The headers 32 communicate with the interior of container 31 by means of a series of perforations 33. It should be noted that one can use slits or other passages for air with the same efficiency to replace the perforations shown here. The headers 32 are connected by air evacuation lines 34 to an aspiration source (not shown). An evacuation fan, driven by a motor, can operate satisfactorily for most of the applications.

The mats 20 are transported in their container 31, where they are arranged by hand, and air is aspirated from the mass of fibrous materials through the perforations 33 and headers 32. As air is aspirated, the mats are compressed and successive mats 20 can be positioned in the container, until a package of the desired dimensions has been obtained

Referring to Figure 2, a device is shown that is used to package the compressed mats 20, which comprises a sheet 35, which can preferably be a sheet of kraft paper. The sheet 35 is placed in container 31 and the mats are stacked and compressed on top. When a complete package is made, a first fold of sheet 35 can be positioned at the top of the upper mat, which adheres tightly to the upper surface of the package, because aspiration or air still exerts tension through the perforations 33. In this manner, another fold of sheet 32 can be placed on the first sheet and can be attached by means of an adhesive, staples, etc. Aspiration of air is then cut off through lines 34 and packaging is completed.

To facilitate removal of the package from container 31, a header is mounted on one wall of container 31, preferably the lower wall, and communicates with the interior of container 31 through perforations 38. The header 36 is connected to a controlled pressure source (not shown) by means of a line 37. When the package is ready to be removed, the pressure source is connected to header 36 via line 37 and air passage through perforations 38 produces on the inside surface of container 31 a film of air that permits the package to be easily removed. The air pressure can be increased to a point where the package acts as a piston in the container 31 in the shape of a box. The air pressure then acts as a hydraulic fluid and facilitates removal of the package from container 31 or entrains it.

The device depicted in Figure 1 thus permits packaging of a large number of mats following a package of similar dimensions. The air-evacuation system is designed, so as to uniformly compress the fibers of mats 20 as well as possible without damaging the individual fibers forming the mats. The mats 20 when unpacked, spring back and resume all of their elasticity and recover their normal swollen shape and all of their value as an insulator.

Referring to Figures 3 and 4, a second variant of the present invention is shown, which comprises a horizontal plate 40, a vertical stop plate 41 and a compression plate or piston 42. A header 43 is attached to the horizontal plate 40 and communicates with the upper surface through perforations 44.

A line 45 serves to connect header 43 to an air evacuation system.

To compress the stacks of fibrous mats, so that the stack is compressed horizontally or vertically, in the past it was necessary to use a mechanical device to prevent the column formed by the stack of mats from buckling by separating from the support plate 40. By evacuating or causing air to escape from the stack of mats 47, while it is mechanically compressed by

movement of the piston plate 42, which approaches the stop plate 41, passage of pressure at the initial speed through the stack of mats 47 toward the perforations 44 keeps the stack 47 in place. As the stack 47 continues to be compressed, the mats become denser, the fibers approach each other and a gradient is produced between the pressure ensured by the rate of air passage through the stacks and the static pressure, due to aspiration through perforations 44, said gradient keeping the stack in place to prevent buckling.

In addition to holding the stack in place and preventing buckling, the perforations 44, the header 43 and the line 45 connected to the air-evacuation system fulfill the function previously indicated for the device depicted in Figures 1 and 2, owing to the fact that they cause air in the interior of the mass of fibrous materials to be evacuated or escape, so as to permit stronger compression of a similar stack of mats than with previously described processes, without rupturing the fibers of the mats. Although the variant shown in Figure 2 represents progress, the variant shown in Figures 3 and 4 represents even greater progress, owing to the fact that not only are the mats compressed by aspiration of air, but this compression is further facilitated by piston 42. One can imagine that rupture of the fibers is avoided in the device depicted in Figure 3, owing to the fact that abrupt expulsion of air from the mats is avoided, as occurred when they were previously compressed mechanically, owing to the fact that the air-aspiration system removes air from the fibrous mats before exerting the same pressures that previously broke or caused the fibers to rupture and reduced their values as insulators and their rebound elasticity. Moreover, the mats situated on the end of the stack are not used to transmit the compression forces to the mats arranged in the center, and the fibers in the mats on the end therefore escape the rupture or breaking forces.

To terminate packaging of the compressed materials with the device shown in Figure 3, a device with an appropriate transverse piston can be used, as is well known in the prior art.

Referring to Figures 5 to 10, a third variant according to the present invention is shown for packaging of stacks of mats of fibrous materials.

Referring to Figures 5 to 10 and, for the moment, to Figure 5, in particular, it is apparent that a stack of mats 54 of fibrous materials is brought by a conveyor 52 to a loading position, where they are stopped against an end plate 51 of a packaging device, shown generally at 50.

Referring to Figures 6 and 7, one will note that a device, shown generally at 60, serves to load the stack 54 and place it in position in a compression station and causes evacuation of air to

be started from the stack of mats. The loading device 60 comprises a loading plate 61, to which a header 62 is attached, perforation 63 causing communication between the header 62 and the loading surface of plate 61. A flexible line 64 ensures connection between the header 62 and the air-evacuation system (not shown). The arrangement formed by header 62 and plate 61 is supported by a frame 67 mounted on rollers 66, so as to impart a back-and-forth movement that causes the stack of mats 54 on conveyor 2 to approach it and makes it return to the compression position. After the stack 54 is in contact with plate 61, because of the pressure due to the velocity of air passage through stack 54, the loading mechanism 60 is returned from the loading partition 53 to the position shown in Figures 6 and 7, carrying with it the stack of mats 54 to position it between the compression plate or piston plate 70 and a base 80.

The compression plate 70 is intended to be driven downward between lateral plates 51 and 55 (Figure 5), in order to compress stack 54 mechanically. Examples of appropriate means of driving plate 70 are already known. The base 80 is mounted on a shaft 84 and is intended to be driven downward by compression of stack 54 to a pressure shown with the dashed line in Figure 7, so that a compressed stack can be situated in a position that permits it to be put into the package by means of a transverse piston 90. A stop 86 can be used to ensure that, in the lowest position, the base 80 is suitably aligned with the transverse piston 90 to ensure that the compressed stack of mats 54 is appropriately held. The base 80 can contain a plate 81, to which a header 83 is attached, perforations 82 ensuring communication between the stack side of plate 81 and header 83. A flexible line 84 can be used to connect header 83 to an appropriate pressure source.

Referring to Figures 6, 7, 8 and 9, and especially Figure 10, it should be noted that the transverse piston 90 consists of a combination of piston and collecting chamber 91, containing flanges 91a and 91b that extend horizontally with a sufficient length to receive a compressed stack of mats 54. The inside surfaces of flanges 91a and 91b have perforations 92, so that they can communicate with the collecting chambers arranged on the inside of flanges 91a and 91b, which are connected to a main header 91.

A flexible line 93 can serve to connect the main header 91 to an appropriate air-evacuation system. A shaft 94 is intended to be connected to an appropriate drive arrangement that serves to impart a shuttle movement to the transverse piston 90 to cause it to penetrate into a package or into a chute-sleeve 100 or cause it to leave when a sufficient amount of mats have

been compressed inside flanges 91a and 91b. A drive arrangement that follows an appropriate shuttle movement can be found in previously known examples, and this arrangement does not form part of the present invention.

Referring to Figures 5, 8 and 9, it should be noted that the chute 100 of the package in a bag is fixed on lateral plate 51 and arranged, so as to receive the flanges 91a and 91b of the transverse piston 90 when a compressed stack 54 must be packaged. The flanges or edges 101 or 102 of chute 100 are curved, so as to receive the curved configuration of the header of flanges 91a and 91b of the transverse piston 90. A bag or sleeve of appropriate packaging material, like kraft paper, can be slid beneath the edges 101 and 102, surrounding them, and can be attached in place by means of a squeezing device 104, which can consist of a means of pneumatic clamping or one activated by a solenoid. An opening is made on the lateral plate 51, in order to permit a transverse piston 90 to move in the chute 100.

Means of unloading of the packages that serve to facilitate unloading of a filled sleeve or bag are shown generally at 100 and 120. Means 110 used to facilitate unloading contain a conveyor 11 and a blowing chamber 113 arranged below the inside surface of the upper loop of the conveyor belt and intended to apply a positive air pressure between chamber 113 and the belt by means of perforations 112 made at the top of chamber 113. The chamber 113 is connected by a line 114 to an appropriate source of pneumatic pressure.

The means 120 that serve to facilitate unloading include a plate 121 are articulated by a hinge 125 on lateral plate 51, so that the plate 121 can be lifted, while the sleeve or bag is positioned on chute 100. The plate 121 is curved upward on its end opposite the end equipped with the hinges (at the unloading end) to permit easy access to the chute 100 and to position a bag on it without having to lift plate 121 more than necessary. The short end of plate 121 also serves to avoid folding of the sleeve or bag or its rupture when the filled package is swollen at the time when it is removed from the chute 100. A filled package tends to swell and abrupt expansion of the package on one sharp corner or on an edge of plate 121 when removed from the chute 100 could rupture or tear the sleeve or bag.

Referring to Figures 5 and 9, it should be noted that a chamber or header 123 is attached to the top of plate 121, and that it communicates with the package side of plate 121 through perforations 122 distributed along its package side. A flexible line 124 can serve to connect the header 123 to an appropriate pressure source.

During operation, the means of loading or means that ensure negative pressure 60 are shifted forward, so that the means used to evacuate air, which are attached to a line 64, cause it to adhere and permit movement of the stack of mats 54 from conveyor 52 across loading partition 53 to bring it to a compression position between piston 70 and base 80, while the means of loading 60 is returned to its initial position. In addition to aspirating air from stack 54 through perforation 63, which moves the stack 54 from the conveyor 52 to bring it into the compression position, this aspiration prevents stack 54 from buckling while it is being compressed.

As previously mentioned for the variant shown in Figures 1 and 3, air is evacuated from the fibrous material through perforations 63, which facilitates compression of the stack of mats 54. Although the lateral plates 51 and 55 of the device are only shown in Figure 5, for reasons of simplification, these lateral plates are advantageously used to facilitate aspiration of air through perforations 63 from the interior of the fibrous mats, reducing the surface of the edges of the mats, which are directly exposed to the ambient air pressure. The compression piston 70 is moved vertically to further facilitate compression of the fibrous mats 54 and initiates the vacuum applied by mechanical compression, in order to raise the density of the mats 54 as they are compressed. When the compression plate 70 moves downward and stack 54 is compressed, the base 40 moves downward, so that the mats are compressed in a position situated between flanges 91a and 91b of the transverse piston 90. Air continues to be aspirated through perforations 92 from the interior of the mats 54 and the kinetic and static pressures obtained by this evacuation are sufficient to maintain the mats in a compressed position in the transverse piston 90 between flanges 91a and 91b, even when vertical piston 70 is lifted to return it to its initial position and a subsequent load of mats 54 is placed in the loading position by operating the loading device 60. This permits compression of two or more loads of stacks 54 of mats and packing in a single bag or sleeve. This reduces the necessary height of the stacking device and reduces the difficulty that exists when dealing with very high stacks of fibrous material mats.

After one or more of the loads of compressed stacks 54 have been positioned between flanges 91a and 91b of transverse piston 90, this returns, by a shuttle movement, to the loading position in the bag or sleeve situated in chute 100. To assist transverse piston 90, in moving the compressed stack of mats and returning it to chute 100, one can apply a positive air pressure through line 85 to header 83. This positive pressure causes air to pass through perforations 82 and forms a support surface with an air film between plate 81 and the compressed mats arranged

between flanges 91a and 91b. A similar arrangement can be used in conjunction with vertical piston 70 to form a support surface with an air film between the lower surface of piston 70 and the top of the compressed stack of mats situated between flanges 91a and 91b, as desired. For reasons of simplicity, however, and because this arrangement would be practically identical to that shown for base 80, the arrangement of the support surface with an air film on vertical piston 70 has been omitted in the drawings.

Use of such air films above and below a compressed stack of mats arranged between flanges 91 and 91b prevents, or at least substantially reduces, shearing of the fibrous mats when the transverse piston is brought to the position within chute 100. These arrangements with an air film need not necessarily depend on the number of loads of each package, the density or ratio of compression of the compressed stack between flanges 91a and 91b and the amount of vacuum applied to the compressed stack by the evacuation system connected to the main header through a line 93.

A bag or sleeve made of a packaging material is introduced to chute 100 and the edges 101 and 102 are fixed in place by one or more means of clamping 104. When the transverse piston 90 has brought the compressed stack to the appropriate position in chute 100, application of vacuum to the flanges of the header flanges 91a and 91b is stopped and the transverse piston 91 is brought to the loading position below the vertical piston 70, whereas the compressed stack of fibrous mats remains in chute 100. It can be advantageous, and this again depends on the pressures and densities of the compressed stack, to invert flow of air within the header 90, in order to form support surfaces with an air film similar to those described previously between flanges 91a and 91b and the compressed stack to assist the transverse piston 90 in withdrawing.

Because it is possible to place a much larger number of mats in a package, whose dimensions are similar to those that were adopted beforehand for shipment, these have an increased tendency to recover their normal height and a more substantial pressure is exerted on a sleeve or bag that contains the stack of compressed mats, while it is still on chute 100. This causes the size of the sleeve or bag to adhere tightly to the outside surfaces of edges 101 and 102 of chute 100, making it practically impossible to remove the bag from the chute 100 after the clamping device 104 has been removed. To reduce the pressure exerted by the package against edges 101, 102, compression forces are applied to the package in a direction perpendicular to the surface presented by edges 101 and 102 by means of the compression surfaces of plate 121 and

conveyor 111. To facilitate removal of the package without destroying it, the means of unloading 110 and 120 furnish a positive air pressure from header 113, 123 through perforations 112, 122 and from lines 114 and 124, respectively, said lines being connected to positive air sources (not shown). The support surfaces with an air film are thus formed between plate 121 and the top of the package and between conveyor 11 and the upper face of header 113. The conveyor 111 is started, it grasps the lower surface of the package and the bag or package is removed from chute 100.

Referring to Figures 11 and 12, they show a combined arrangement of the mandrel and header, in which the headers 150 and 151 fulfill the dual function that consists of evacuating air from a mat, while it is wrapped on mandrel 160, and also end jaws that serve to maintain the roll of mats suitably aligned. Perforations 152 ensure communication between the surfaces for aspiration of air and the headers 150 and 151. An air-evacuation system (not shown) is connected to headers 150 and 151 by means of connections 153 and lines 154. As previously described, the mat is compressed while it is wound on mandrel 160 by aspiration of air from the limits of the fibrous mats through perforations 152 formed on the face of the end jaws 150, 151. The mats can receive a certain mechanical compression by keeping them under tension while they are wrapped on the mandrel. The mandrel can be turned by hand or with any appropriate arrangement known to specialists.

It should be noted that the naming of the material packaged as a mat does not have the purpose of limiting the present invention, but instead represents a generic description of a material to be compressed. The material can be loose or form an integrated layer. Moreover, fibrous material is understood to include porous materials, like glass fibers, mineral wool, felt, cotton, etc., as well as other synthetic compositions, like foam rubber, products in the form of foam, etc., especially those that contain pockets or passages for air or for gases connected to each other or communicating with each other.

It goes without saying that the present invention has only been described above as an example, but in a non-limiting manner, and that any variants within its scope can be applied to it.

Figures	References	
1	A	Evacuation of air
	B	Controlled pressure source
6	C	To air evacuation

SUMMARY

A. A process for packaging of a mass of fibrous material, characterized by the following points, separately or in combination:

1. It consists of evacuating air from inside of the mass and enclosing this mass in a package from which air has been evacuated;

2. This mass of fibrous material is mechanically compressed, while air is evacuated;

3. A negative pressure or underpressure is formed on the side of the stack to prevent the column formed by the stack from buckling during compression;

4. The fibrous mass consists of a stack of fibrous mats;

5. The means used to evacuate air are arranged near at least one side of the stack to prevent it from buckling during compression;

6. An air film is formed between the package and an unloading surface to facilitate handling of the package;

7. A conveyor is positioned so as to be in contact with one side of the package;

8. The compressed mass is placed in a transverse piston, and a negative pressure is ensured in the vicinity of this mass situated in the transverse piston to keep the mass compressed;

9. The preceding operations are repeated until a predetermined number of loads of fibrous masses have been placed in the transverse piston;

10. The piston is introduced into a package, the negative pressure or underpressure is removed from the mass of fibrous material to permit it to expand in the package, then the piston is withdrawn, leaving the fibrous material in the package;

11. The surfaces are used to keep the package in an open position to receive the fibrous mass, this package is compressed when the mass swells within it, in order to reduce the pressure against the surfaces holding the package open, and an air film is formed between at least one of the compression surfaces and the package to facilitate its removal;

12. To package a section of fibrous materials, the section is wrapped onto a mandrel and air evacuated from the interior of this fibrous mass to compress it;

13. To remove the packages of fibrous masses packed from the interior of the box-shaped container, a pneumatic pressure is applied between the package and the bottom of the container.

B. A device for packaging a mass of fibrous materials, characterized by the following points, separately or in combination:

14. It comprises a device to evacuate air from the interior of this mass, a device to mechanically compress this mass and a device to package this mass, in order to cause it to essentially keep the configuration that it has when it is compressed;

15. The device used to compress a stack of fibrous mats includes a device to compress this stack, a device to support one side of the stack and a device to maintain a negative pressure surface near the supported side of the stack to prevent buckling on the side that is not supported;

16. The device includes a compression station, a device to position the mass in this compression position, this position containing a device to evacuate air from the interior of the mass and a device to mechanically compress this mass while air is evacuated and a device to package the compressed mass;

17. A transverse piston, driven in a shuttle movement, is used to bring the compressed mass into the packing device;

18. A device is used to form a support surface with an air film for the compressed mass when it is moved by the transverse piston to avoid damaging it;

19. The transverse piston contains a device to form a surface with negative pressure near the mass, in order to keep it in its configuration when it is compressed;

20. The packaging device includes a device to maintain the package to receive the compressed mass from the transverse piston, this device containing two opposite edges spaced from each other to receive a package surrounding them;

21. A device is used to remove the package formed by the compressed material from these edges, this device containing surfaces that compress this package, in order to reduce the pressure exerted by this package on the edges and a device to form an air film between the package and at least one of the compression surfaces;

22. One of these compression surfaces consists of a conveyor intended to remove the package from the edges;

23. The compression surfaces are arranged facing each other, in order to compress the package in a direction almost perpendicular to the surface presented by the edges, at least one of the compression surfaces is curved to the exterior away from the package on its removal end to

permit the package to slowly swell, while it is removed from the edges, so as to avoid shearing and tearing the package;

24. The device used to package a section of fibrous materials includes a mandrel, a device to wind this section on this mandrel and a device to evacuate air from the interior of this fibrous material, while it is wrapped on the mandrel;

25. The device used to fill and unload a container, which can be flattened, includes a device to maintain the size of this container at a spacing from each other, in order to open the container, a device to bring a load of compressed material into this open container and to suppress the compression applied on this load, allowing it to swell to the limits of the container, a device to remove this container from the compressed material of the holding device, this device containing surfaces that compress this container, in order to reduce the pressure exerted on the holding device, and a device to form an air film between the container and at least one of the compression surfaces;

26. A support surface is arranged on the side of a conveyor loop opposite the loop in contact with the container, a device forming a support surface with an air film between the support surface and the associated side of the loop.

C. A device for moving loads exerting a force perpendicular to the direction of movement, characterized by the following points, taken together or separately:

27. It includes a conveyor that contains a loop, one side of which is in contact with the load, a support device arranged facing this load on the contact side of the loop and a device forming a support surface with an air film between the support surface and the loop;

28. The conveyor includes a transport surface for a load, a means of support for this transport surface of the load and a device forming an air film between this support device and the surface carrying the load of the conveyor.

Company named:

OWENS-CORNING FIBERGLAS CORPORATION

agent:

SIMONNOT & RINUY

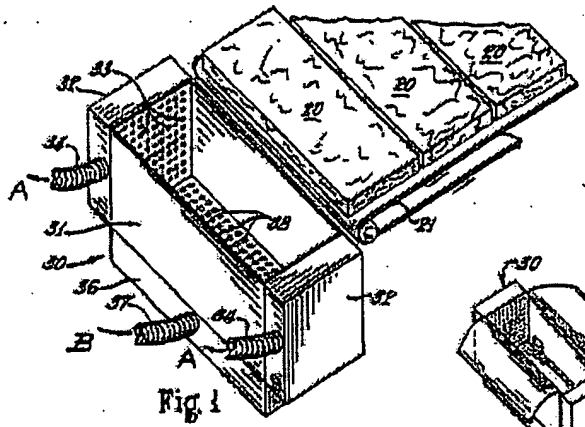

Fig. 1

Fig. 2

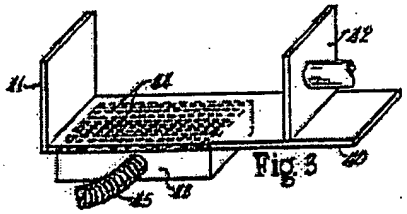

Fig. 3

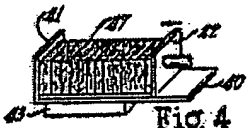

Fig. 4

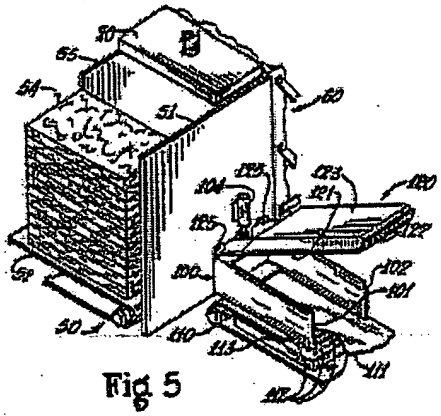

Fig. 5

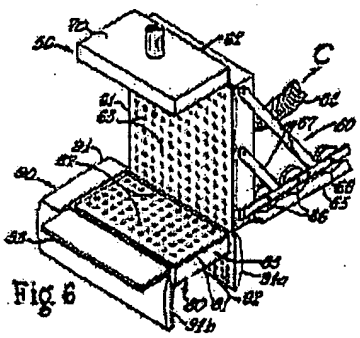

Fig. 6

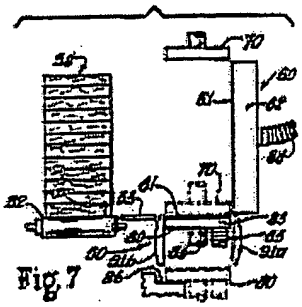

Fig. 7

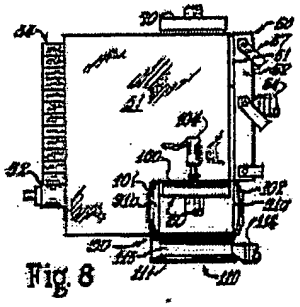

Fig. 8

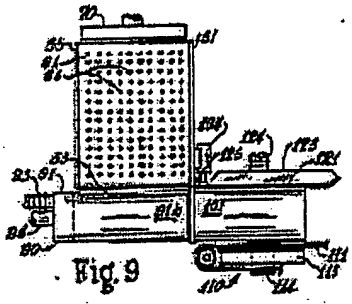

Fig. 9

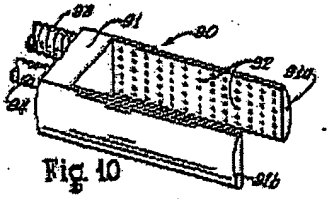

Fig. 10

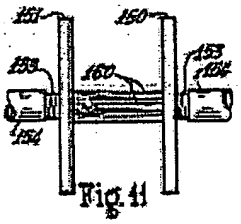

Fig. 11

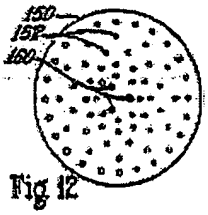

Fig. 12